

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
14 July 2005 (14.07.2005)

PCT

(10) International Publication Number  
**WO 2005/064409 A3**

(51) International Patent Classification<sup>7</sup>: G03F 7/20

(21) International Application Number:  
PCT/IB2004/052886

(22) International Filing Date:  
22 December 2004 (22.12.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
03104940.6 23 December 2003 (23.12.2003) EP  
04102397.9 28 May 2004 (28.05.2004) EP

(71) Applicant (for all designated States except US): KONINKLUKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(72) Inventors; and

(75) Inventors/Applicants (for US only): DIRKSEN, Peter [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). MORTON, Robert, D. [GB/BE]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). ZANDBERGEN, Peter [NL/BE]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). VAN STEENWINCKEL, David [BE/BE]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). AKSENOV, Yuri [RU/BE]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). LAMMERS, Jeroen, H. [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). VAN WINGERDEN, Johannes [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). MARINIER, Laurent [FR/BE]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(74) Agents: ELEVELD, Koop, J. et al; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,

GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Declaration under Rule 4.17:**

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(U)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

**Published:**

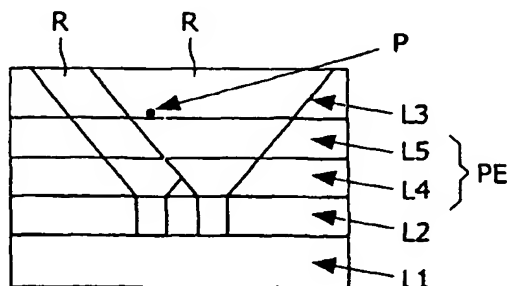
— with international search report

(88) Date of publication of the international search report:

9 March 2006

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: REMOVABLE PELLICLE FOR IMMERSION LITHOGRAPHY



(57) Abstract: A method of irradiating to pattern a photosensitive layer such as a resist (L2) immersed in a fluid (L3), involves applying a removable transparent layer (L4, L5), projecting the radiation onto the resist through the immersion fluid and through the transparent layer, such that imperfections in the fluid are out of focus as projected on the surface, and subsequently removing the transparent layer. The transparent layer can help distance such imperfections from the focus of the radiation on the surface and so can reduce or eliminate shadowing. Hence the irradiation can be more complete, and defects reduced. It can be particularly effective for imperfections in the form of small bubbles or particles in the immersion fluid especially at the fluid/surface interface for example. The radiation can be for any purpose including inspection, processing, patterning

and so on. The removal of the transparent layer can be combined with a step of developing the resist layer.

WO 2005/064409 A3